**SUPPLEMENTAL, SURREBUTTAL TESTIMONY OF**
**ED BURGESS**
**ON BEHALF OF CAROLINAS CLEAN ENERGY BUSINESS ASSOCIATION**
**IN RESPONSE TO WITNESS PETER B. DAVID'S CORRECTIONS**
**DOCKET NO. 2021-88-E**

**Q. Did you hear the corrections that Mr. David made from the witness stand on Friday August 20, 2021?**

A. Yes.

**Q. Can you briefly summarize those changes as you understand them?**

A. Yes. Mr. David made several substantive changes to his testimony from the witness stand. He prefaced these changes as being only 3 minor corrections, all on the same topic. Indeed, the first 3 corrections he made (some of which were multipart corrections) all related to the issue of hourly weighting of the VIC to solar production. Specifically, witness David modified his original testimony and study to remove claims that he had used hourly weighting in calculating the VIC charge. That is a significant change to Mr. David's original testimony, and my direct testimony identified the fact that hourly weighting was not used as indicated by the study as stated in Mr. David's original testimony.

Hourly weighting is essential to accurately capture the impact of solar variability on DESC's system because it is undisputed that the *magnitude* of variability in predictably low production hours (e.g., morning, evening, and cloudy weather) will be smaller than the magnitude of variability during high production times (in the middle of sunny days). Failure to use hourly weighting means that the costs underlying DESC's VIC assume that DESC has to maintain the same level operating reserves during all solar operating hours in each month. For example, in

January, DESC's VIC includes the costs of carrying a constant 244 MW level of incremental reserves (for Tranche 1) during all daylight hours, including both evening hours (e.g. 5pm) and midday hours (e.g. 12pm), even though those hours will have predictably different levels of solar generation and the evening hours will have a much lower magnitude of potential forecast error (in MW) than the VIC assumes. My direct testimony included analysis showing that applying hourly weighting to Guidehouse's own study output, along with one other change, would result in a VIC of $0.47/MWh rather than $1.80/MWh for Tranche 1. Applying *just* the hourly weighting to Guidehouse's study output (and not any other recommended change) would result in a VIC of $0.73/MWh rather than $1.80/MWh for Tranche 1.

**Q. Were those all the changes Mr. David made?**

A. No. There was also a fourth and in many ways a much more significant change to Mr. David's rebuttal testimony. This change replaced the reference to one set of the Excel workbooks (namely the "Guidehouse VIC Calculation Workbook," produced in response to ORS data request 1-4) to an entirely different set of Excel workbooks, which DESC produced in response to CCEBA data request 2-14.

**Q. Would your surrebuttal have been different if the updated reference to DESC's response to CCEBA 2-14 had been included in Mr. David's original rebuttal testimony?**

A. Yes. The original Excel workbook reference did not make any logical sense to me in the context of Mr. David's original rebuttal and my surrebuttal focused on this disconnection. Meanwhile, the corrected reference to DESC's response to CCEBA 2-14, while more logical upon correction, significantly changes my fundamental understanding of Guidehouse's overall VIC analysis. Thus, if the correct reference had been used, my surrebuttal would have been substantially different.

**Q. Can you explain why the corrected reference to CCEBA 2-14 is so significant in this context and how it changed your understanding of Guidehouse's analysis?**

A. Yes. Mr. David's original rebuttal downplayed the significance of the spreadsheet workbooks produced in DESC's response to CCEBA 2-14 as just concerning a few "illustrative examples."[1] Now, with the corrected reference, it is clear that the information in DESC's response to CCEBA 2-14 is central to Guidehouse's analysis and purports to demonstrate a need for increased operating reserves (i.e., Section 4 of the Guidehouse study). More specifically, Mr. David's corrected testimony claims that the material produced in response to CCEBA 2-14 proves that there is a "need to increase available operating reserves in the relatively small number of hours in which the Company does not carry an excess in the Baseline scenario."[2] In other words, Guidehouse believes these Excel workbooks prove that there would be a shortage of operating reserves under a "business as usual" scenario unless additional reserves are added. That need for additional reserves underpins the entire rationale for implementing a VIC in the first place.

**Q. What do the Excel workbooks attached to DESC's response to CCEBA 2-14 contain?**

A. They contain results of the PROMOD runs conducted for the VIC analysis for each timestep.[3] They also contain calculations for the MW of projected reserve shortfall, and potential risk of solar reduction, for each timestep. What the data show is that in the model run representing Tranche 1 with *no* additional (incremental) reserves contained "only 156 hours across the entire forecast in which there is a risk of operating reserve shortfall…In other words, the referenced file shows that

[1] For example, see page 22 of Mr. David's Rebuttal, lines 8-14. See also page 13, lines 12-16.
[2] David Rebuttal (Original), p 10, lines 5-7.
[3] Note that there is a formula error in the Excel workbook for the years 2029-2031 in DESC's original response to CCEBA request 2-14. Guidehouse acknowledged this error in rebuttal testimony (David rebuttal, page 22) and provided a corrected version on August 24, 2021.

there are … only 0.18% of hours across the entire forecast in which there is a risk of operating reserve shortfall due to an unexpected drop in solar generation."[4] This undermines the credibility of Guidehouse's subsequent VIC modeling premised on the addition of incremental reserves during 100% of solar hours (or ~50% or total hours).

**Q. Do you believe that the asserted need for increased reserves (i.e., Section 4 of the Guidehouse study), which Guidehouse claims is supported in the Excel workbooks in DESC's response to CCEBA 2-14, is justified?**

A. No. The analysis DESC provided in the workbooks in response to CCEBA 2-14 has at least four major problems, some of which I briefly touched on in my prior testimony before being made aware that the spreadsheets produced in response to CCEBA 2-14 are at the very core of determining the need for a VIC. Correcting just one of these errors would eliminate the claimed need for additional operating reserves altogether and thus eliminate the need for a VIC for Tranche 1. Correcting more than one of these errors would also likely eliminate (or at least significantly reduce) the need for a VIC in subsequent tranches.

**Q. If the Commission agrees with your assessment that DESC has not provided sufficient evidence of the need for a Tranche 1 VIC, does it have the legal authority to eliminate this charge?**

A. Yes. This is clearly established in the following language enacted through Act 62 (emphasis added):

S.C. Code of Laws Section 58-41-20(E)

[4] DESC response to CCEBA 3-3

(3) In establishing standard offer and form contract power purchase agreements, the commission shall consider whether such power purchase agreements **should prohibit** any of the following:

(b) the electrical utility **reducing the price paid to the small power producer based on costs incurred by the electrical utility to respond to the intermittent nature of electrical generation by the small power producer.**

**Q. Can you explain each of these four problems you mentioned in greater detail?**

A. Yes. These problems are most clearly demonstrated by examining one of the Excel workbooks produced in response to CCEBA request 2-14, specifically "CCEBA Discovery Request 2-14 973 noInc Reserves_corrected 8-24.xlsx." That document shows the corrected output of Guidehouse's hourly reserve analysis for Tranche 1 with no incremental reserves having been added (i.e., the "business as usual" or "Baseline scenario"). The four problems are explained below.

- *Problem #1 – Absence of Geographic Diversity:* Column G of the Hourly Summary tab in "CCEBA Discovery Request 2-14 973 noInc Reserves_corrected 8-24.xlsx" shows that Guidehouse assumed that a drop in solar production would occur at *all* solar facilities simultaneously. Thus, the analysis does not accurately account for any geographic diversity of solar variability. This is not remedied by Mr. David's claim that Guidehouse made a rough approximation of the correlated, system-wide drop in solar production that could occur based on Guidehouse's "extensive analysis."[5] The detailed results and a transparent methodology for this "extensive analysis" have yet to be provided by DESC or Guidehouse to any party in this proceeding.

[5] David rebuttal at p.17, lines 15 – 19

- *Problem #2 – Exclusion of 576 MW of Pumped Hydro as a potential source of Operating Reserves:* "CCEBA Discovery Request 2-14 973 noInc Reserves_corrected 8-24.xlsx" also shows that Guidehouse excluded the 576 MW Fairfield Pumped Hydro Storage facility from being able to provide any operating reserves unless it was already pumping or generating. This categorical exclusion of Fairfield conflicts with actual operating practice: DESC confirmed elsewhere that if the facility was not pumping or generating, it could be ramped up in approximately 3 minutes[6] and its own system operator (Mr. Hanzlik) confirmed that Fairfield is used to integrate solar. Yet regarding the shortfalls shown in the workbook produced in response to CCEBA 2-14 for the Tranche 1 baseline (no incremental reserves) scenario, DESC later confirmed that "The Fairfield facility is not providing operating reserves in any of the 156 hours that the referenced file indicates there is a potential reserves shortfall."[7] If Fairfield were permitted to contribute to reserves during hours it was not already pumping or generating, it would have been able to eliminate all 156 hours with identified reserve shortfalls in the Tranche 1 simulation that had no incremental reserves added, and possibly all of the Tranche 2 shortfalls as well.[8] Moreover, if properly defined as a quick start resource, Fairfield would be able to provide these incremental reserves without any incremental cost. In my opinion, DESC has never given a reasoned explanation as to why Fairfield was excluded from being defined as a quick start resource that could be a source of reserves within the relevant 15-minute time horizon,

[6] DESC response to Pine Gate 1-2

[7] DESC response to CCEBA 3-8. Note: this CCEBA discovery request, like all those prefaced with a "3," was served on DESC after the August hearing consistent with the Chairman's granting of CCEBA's motion seeking leave to file additional discovery and testimony in light of Mr. David's significant changes to his testimony on the stand.

[8] Note that DESC's response to CCEBA 3-8 only contained information pertaining to Tranche 1.

even though Fairfield has repeatedly been identified by DESC as quick start resource used by the Company to integrate solar.

- *Problem #3 – Magnitude of Potential Drop in Solar Production*: The formula in Column G of CCEBA Discovery Request 2-14 973 noInc Reserves_corrected 8-24.xlsx shows that Guidehouse assumed a drop in solar production could equal 60% of hourly production. This 60% assumption differs from DESC's current operating practice which is to hold reserves for solar variability equal to 40% of expected production. The Guidehouse study contains no discussion or analysis of why the 60% threshold is more appropriate than DESC's current practice.

  The workpapers I provided with my direct testimony ("CCEBA Discovery Request 2-14 973 noInc Reserves EB.xlsx") demonstrated that if the 60% assumption in CCEBA 2-14 were adjusted to the current 40% level, it would eliminate *all* of the identified reserve shortfall hours for Tranche 1 over the forecast period. DESC later confirmed this.[9] That is, continued use of the 40% drop assumption, which has served DESC well, rather than Guidehouse's 60% drop assumption, would largely eliminate the need for any VIC. For Tranche 2, use of a 40% drop assumption would eliminate the reserve shortfall in all but 7 hours over the 10-year forecast period (i.e. <0.01% of hours). If this correction were made in conjunction with others noted above, it is virtually certain there would be no shortfall hours for Tranche 2 as well (i.e., no VIC would be needed).

- *Problem #4 – Maximum Reserve Shortfall Hour*: "CCEBA Discovery Request 2-14 973 noInc Reserves_corrected 8-24.xlsx" shows that the maximum reserve shortfall identified by Guidehouse in the Tranche 1 model simulations with no additional reserves added over

[9] DESC response to CCEBA 3-12

the 10-year period was 151 MW in a single hour. DESC confirmed this in discovery produced after Mr. David changed his testimony.[10] This figure of 151 MW is significantly smaller than than the incremental operating reserves Guidehouse assumed for Tranche 1 in its "with incremental reserves" analysis, which ranged from 233-382 MW, depending on the month.[11] The 233-382 MW of incremental reserves that Guidehouse assumed in its VIC modeling were based on a non-transparent "Monte Carlo simulation" that purports to select the 90th percentile of solar drops. However, this is at odds with the fact that the most extreme level of reserve shortage simulated over the 10-year forecast period when no new reserves are added (151 MW, i.e., the 100th percentile) is significantly lower than what Mr. David claims to be the 90th percentile (i.e., 233-382 MW) of incremental reserve needs.

No party to this case has actually seen the underlying methodology for how the 90th percentile incremental reserve levels were determined. Similarly, for Tranche 2, the highest level of simulated reserve shortfall during a single hour over the 10-year forecast period is 264 MW. This is significantly lower than Guidehouse's recommended increase in required reserves above the Baseline for Tranche 2, which ranges up to 449 MW, depending on the month, and applies to all solar hours. To summarize, the Guidehouse-recommended incremental operating reserves appear to be up to 153% higher than necessary (depending on the month) during all solar hours even when compared to the most extreme single hour in the 10-year model forecast for Tranche 1. Similarly, the Guidehouse-recommended reserves for Tranche 2 are up to 70% higher than necessary (depending on the month)

[10] DESC response to CCEBA 3-6
[11] See Exh. PBD-2, Table 4.

during all solar hours even when compared to the most extreme single hour in the 10-year model forecast.

**Q. DESC's response in CCEBA 3-8 states that "while the Fairfield facility could provide enough operating reserves in those 156 hours at low or no cost to erase any potential shortfall" there may be other limitations that prevent this. Do you agree that these limitations would necessarily prevent it from providing reserves during these hours?**

A. No. DESC acknowledges that Fairfield *can* provide quick start reserves (contrary to how it was modeled), but says this is only true if there is sufficient capacity in the reservoir. Meanwhile, DESC provided no historical data or evidence to suggest that low reservoir capacity would be a limiting factor during these hours, or that low reservoir capacity represents likely conditions during most times. In fact, past experience suggests that the reservoir is at least partially full during most hours. For example, in the 2019 Avoided Cost proceeding, Witness Stenclik noted that the Fairfield reservoir was at least partially full in all but 405 hours during the year, or over 95% of the time.[12] Yet, this does not appear to be reflected in the Guidehouse modeling efforts. Additionally, DESC suggests that if Fairfield were to provide operating reserves, it would result in an incremental cost to change the dispatch. However, if properly modeled as a quick start reserve, any change to the dispatch would likely be exceedingly rare. If Fairfield is operating as a quick start reserve, there would be no need to regularly change the dispatch or switch operating modes, but rather Fairfield would simply need to be prepared to switch in the extremely unlikely event that there is a large solar forecast error. By simply being prepared to switch, no redispatch would necessarily occur

[12] Direct Testimony of Derek P. Stenclik, Exh. B, page 16. Docket #2019-184-E.

and no incremental cost would be incurred. As explained above, there has been no reasoned explanation provided for why Fairfield should not qualify as a quick start reserve.

**Q. Regarding Problem 3, DESC's subsequent response to CCEBA 3-12 identifies two reasons why the current practice of 40% may not be sufficient. Do you agree that these are valid concerns?**

A. No. First, in its response to CCEBA 3-12, DESC claims that "Guidehouse's analysis demonstrates that this [40%] value is not sufficient to account for a one-in-ten-year type event, and the fact that DESC has not experienced such an event over the two year period during which it has begun to integrate the Tranche 1 solar capacity is not statistically significant."[13] However, even if a separate one-in-ten-year analysis was conducted to show this, DESC/Guidehouse has failed to provide any detailed information on the underlying methodology used to conduct this analysis, let alone the detailed results of this analysis. I am concerned that this one-in-ten-year analysis may contain serious flaws that suggested higher incremental operating reserve needs than is accurate. As noted by ORS Witness Horii, "Guidehouse has not justified their forecast of incremental operating reserves needed to accommodate solar forecast uncertainty."[14]

**Q. What do you conclude from these observations regarding Mr. David's changes and corrections, including the reference to DESC's response to CCEBA 2-14, and your updated understanding of the Guidehouse analysis?**

A. Guidehouse and DESC have exaggerated the need for additional operating reserves without providing any transparent data or analysis to support for this conclusion. When examined in closer

[13] CCEBA 3-12
[14] Horii Direct at P.8, Lines 15 – 17.

detail, the Guidehouse analysis does not appear to be sound and casts doubt on the notion that DESC needs *any* incremental operating reserves to integrate Tranche 1 solar. This is consistent with my direct testimony. Beyond Tranche 1, I agree that a need for incremental reserves may emerge at some point; however, the analysis provided in the Guidehouse study still substantially exaggerates the magnitude of this need.

**Q. Do you have any remarks regarding the overall transparency of DESC's analysis on this matter?**

A. Yes. Importantly, none of the analysis supporting the need for incremental operating reserves was provided in DESC's initial application, amended application, or direct testimony (including the Guidehouse study). The supporting, flawed analysis was only provided through discovery that CCEBA initiated. Furthermore, DESC downplayed the significance of this analysis in its rebuttal, and its significance was only revealed through a last-minute correction on the witness stand.

**Q. Do you have any changes to your initial recommendations that is informed by these corrections?**

A. No. I believe this new information further elucidates the lack of any evidentiary support for applying a VIC charge to Tranche 1. It also confirms that a fixed VIC charge of $1.80/MWh is exaggerated and that there is merit to setting a fixed VIC at a lower level. In my direct testimony, I suggested three potential modifications to the final VIC calculation that, in combination, led to CCEBA's alternative VIC recommendation of $0.28/MWh for Tranche 1 and $0.71/MWh for Tranche 2 and beyond. In light of the flaws with Guidehouse's initial determination of need (as shown in DESC's response to CCEBA 2-14), I recommend that to the extent that this Commission

decides that a fixed VIC charge should be determined in this proceeding, that the Commission adopt my alternative calculations as described above as the basis for the fixed charge.

Alternatively, at a minimum the Commission should apply hourly weighting to the Guidehouse model results as the basis for a *fixed* VIC charge, to be updated on a prospective basis for PPAs executed after an independent analysis is conducted. Applying hourly weighting to Tranche 1, using the Guidehouse modeling, results in a fixed VIC charge of $0.73/MWh. The $0.73/MWh fixed VIC charge should also be applied to any PPAs executed prior to an independent analysis. To the extent that this Commission maintains an interim VIC rather than fixing the VIC at one of my recommended levels, the interim VIC should be set at a maximum level of $0.73/MWh.

**Q. Does this conclude your supplemental, surrebuttal testimony?**

A. Yes.